REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-62 remain in the application, with claims 4-7, 19-21, 23-26, 31-42, and 45-62 having been withdrawn from consideration. Claim 43 has been amended to specify that the electrical field changes with changes in distance between the substrate and the cantilever, as recited in claim 1.

Claims 1-3, 8, 9, 22 have been rejected under 35 U.S.C. 102(e) as being anticipated by Binnig et al. (US 7054257).

In regard to claim 1, Binnig et al. was cited as teaching a cantilever disposed with a medium which is movable relative to the cantilever; a device associated with the cantilever and which is configured to be responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever; a heater disposed on the cantilever for selectively heating the medium and for inducing localized topographical changes which represent bits of data; and a circuit which electrically interconnects both of the device and the heater.

This rejection is traversed. The Applicants respectfully submit that the invention defined in claim 1 includes features and combinations of features that are not shown or suggested by Binnig et al. In particular, claim 1 includes a device associated with the cantilever and which is configured to be *responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever.* The Office Action cites column 7, lines 10-30 and fig. 3 element 25; and column 18, lines 59-67 and column 19, line 1 and fig. 9, as showing this feature. However, the Applicants respectfully submit that Binnig et al. does not show or suggest the use of a device that is *responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever.*

Binnig et al. shows a probe of the type discussed in the background section of the present application in paragraphs [0003] – [0008]. That is, Binnig et al. uses thermal sensing that responds to changes in the thermal conductance between a heating element and a storage medium. The field discussed in column 7 lines 10-30 of

Binnig et al. is an area of the storage medium, not an electric field. Column 7 lines 10-30 of Binnig et al. describe a read process in which changes in the temperature of a heater result from changes in heat transport across a gap between the heater and the storage medium.

With regard to the Applicants' previous arguments, the Office Action states:

> "In regard to applicant's arguments that Binning et al. does not show a device associated with the cantilever and which is configured to be responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever, the examiner maintains this rejection because in fig. 9 and column 18 lines 59-67 and column 19 line 1 there is a method shown of proximity sensing by using the capacitance between electrodes."

However, capacitance shown in fig. 9 and discussed in column 18, lines 59-67 and column 19, line 1 of Binning et al. is between electrodes on the lever, and electrodes on a support structure (i.e., item 81 in FIG. 8). The Applicants' claim 1 specifies that the device is configured to be responsive *to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever*. Binning et al. does not disclose or suggest any means for establishing *an electrical field between the medium and the cantilever*. Thus Binning et al. does not disclose or suggest any device configured to be responsive to *changes in an electrical field between the medium and the cantilever*.

In regard to claim 2, Binnig et al. was cited as teaching that the circuit forms at least a part of one of the devices.

Since claim 2 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 3, Binnig et al. was cited as teaching that there must be portions connecting the read element 25 of Binnig et al. and the heater.

Since claim 3 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 8, Binnig et al. was cited as teaching that the cantilever comprises a probe which extends from the cantilever and which is configured to be contactable with a surface of the medium and to respond to a topography of the medium to cause the distance between the cantilever and the medium to vary.

Since claim 8 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 9, Binnig et al. was cited as teaching that the medium is electrically non-conductive and is supported on an electrically conductive substrate.

Since claim 9 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 22, Binnig et al. was cited as in the rejection of claim 1. Regarding the electrically non conductive medium of claim 22, Binnig et al. was cited as in the rejection of claim 9.

This rejection is traversed. The Applicants respectfully submit that the invention defined in claim 22 includes features and combinations of features that are not shown or suggested by Binnig et al. In particular, claim 22 includes a device formed in the cantilever which responds *to a change in electric field induced by a change in distance between the cantilever and a substrate on which the medium is supported.* As stated above, Binnig et al. shows a probe of the type discussed in the background section of the present application in paragraphs [0003] – [0008]. That is, Binnig et al. uses thermal sensing that responds to changes in the thermal conductance between a heating element and a storage medium. The field discussed in column 7 lines 10-30 of Binnig et al. is an area of the storage medium, not an electric field. Column 7 lines 10-30 of Binnig et al. describe a read process in which changes in the temperature of a heater result from changes in heat transport across a gap between the heater and the storage medium.

Furthermore, the capacitance shown in fig. 9 and discussed in column 18, lines 59-67 and column 19, line 1 of Binning et al. is between electrodes on the lever, and electrodes on a support structure (i.e., item 81 in FIG. 8). The Applicants' claim 1

specifies that the device is configured to be responsive *to a change in electric field induced by a change in distance between the cantilever and a substrate on which the medium is supported.* Binning et al. does not disclose or suggest any means for establishing *an electrical field between the substrate and the cantilever.* Thus Binning et al. does not disclose or suggest any device configured to be responsive to *changes in an electrical field between the substrate and the cantilever.*

Claims 10-13, 15-18, 27-30 and 43-44 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Binnig et al. in view of Azuma et al. (US 6477132).

In regard to claim 10 and 27, Binnig et al. was cited as teaching all the elements of claim 10 except for the device being a FET (Field Effect Transistor). Azuma et al. was cited as teaching that the device is a FET (Field Effect Transistor). According to the Office Action, at the time of invention it would have been obvious to one of ordinary skill in the art to provide the apparatus of Binnig et al. with the FET's of Azuma et al.

Since claims 10 and 27 depend from claims 1 and 22 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 1 and 22, and for the following reasons. While Azuma et al. discloses the use of FETs, the FETs of Azuma et al. do not respond *to a change in electric field induced by a change in distance between the cantilever and a substrate on which the medium is supported.* More particularly, the FETs described at column 18, lines 29-37 of Azuma et al. are used as switching devices 47 in fig. 15 to control the application of a recording voltage.

In regard to claims 11 and 28, Azuma et al. was cited as teaching that the circuit comprises a plurality of electrically conductive traces which are formed in the cantilever and which comprise a source and a drain of the FET and wherein the source or drain of the FET forms part of a circuit which supplies electrical current to the write/read tip.

Since claims 11 and 28 depend from claims 10 and 27 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 10 and 27, and for the following reason. The Applicants respectfully

submit that fig. 1 of Azuma et al. does not show a plurality of electrically conductive traces which are formed in the cantilever and which comprise a source and a drain of the FET which supplies electrical current to a *heater*. The tip 203 in fig. 1 of Azuma et al. is not a heater.

In regard to claim 12, Azuma et al. was cited as teaching that the plurality of electrically conductive traces further comprise a channel interposed between the source and the drain of the FET.

Since claim 12 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11.

In regard to claim 13, Binnig et al. was cited as teaching that the cantilever is made of silicon and the electrically conductive traces are formed by doping the silicon to render selected regions electrically conductive.

Since claim 13 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11.

In regard to claims 15 and 44, Binnig et al. was cited as teaching that the cantilever has a pair of arms which are interconnected by a bridge member, wherein the probe is formed on the bridge member, wherein the heater is formed on the bridge member, and wherein the doped traces are formed on both arms.

Since claim 15 depends from claim 14, the rejection of claim 15 is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 14. In addition, since claim 44 depends from claim 43, the rejection of claim 44 is traversed for the reasons set forth below with respect to the traversal of the rejection of claim 43.

In regard to claim 16, Binning et al. was cited as teaching feeding a heater element with a current, and Azuma et al. was cited as teaching feeding the probe with a current driven by a FET.

Since claim 16 depends from claim 10, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 10, and for the following reasons. The Applicants respectfully submit that the cited references do not disclose or suggest the use of an FET as a heater. More particularly, the FET of fig. 1 of

Azuma et al. does not function as a heater. Furthermore, the probe 203 of fig. 1 of Azuma et al. is electrically isolated from the source and drain by an insulator 202, thus Azuma et al. does not show feeding the probe with a current driven by a FET.

In regard to claims 17 and 29, Azuma et al. was cited as teaching an induced channel FET.

Since claims 17 and 29 depend from claims 10 and 27 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 10 and 27.

In regard to claim 18, Binning et al. was cited as teaching that the medium is electrically non-conductive and is supported on a substrate which is electrically conductive (referring to the rejection of claim 9 above), and wherein the substrate is configured to be circuited with the tip so that variations in the electrical field which result from a change in distance between the medium and the cantilever, induces a change in electrical current passing through the tip, and produces a read signal (referring to the rejection of claim 1 above). Further in regard to the FET of claim 18, Binnig et al. and Azuma et al. were cited as in the rejection of claim 10 above.

Since claim 18 depends from claim 3, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 3, and for the following reasons. The Applicants respectfully submit that Binning et al. does not disclose or suggest the use of a substrate that is configured to be circuited with a tip so that variations in the electrical field which result from a change in distance between the medium and the cantilever, induces a change in electrical current passing through the tip, and produces a read signal

In regard to claim 30, Azuma et al. was cited as teaching that the cantilever is formed of silicon and the tip comprises a doped portion which is electrically connected with doped regions that form a source and a drain of the FET.

Since claim 30 depends from claim 27, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 27, and for the following reasons. Claim 30 specifies that the *heater* comprises a doped portion. The

Applicants respectfully submit that Azuma et al. do not disclose or suggest a cantilever formed of silicon and wherein the *heater* comprises a doped portion.

In regard to claim 43, Azuma et al. was cited as teaching FET means formed in a silicon cantilever by doping electrically conductive source and drain regions in a selected surface of the cantilever, for being gated by an electric field which is generated by applying a bias to a substrate separate from the cantilever; a probe on the selected surface of the cantilever.

Binning et al. was cited as teaching heater means in the cantilever proximate the probe for heating and forming a data bit indicative topography in a medium to be engaged by the probe.

This rejection is traversed. The Applicants respectfully submit that the invention defined in amended claim 43 includes features and combinations of features that are not shown or suggested by Azuma et al. In particular, amended claim 43 specifies that the electrical field changes with changes in distance between the substrate and the cantilever. In the Office Action, the Examiner cites fig. 3, element 1010 and column 9, lines 36-38 of Azuma et al. as teaches this feature. However, while fig. 3 of Azuma et al. show the application of a bias to a substrate, Azuma et al. does not disclose or suggest a FET that is gated by an electric field which changes with changes in distance between the substrate and the cantilever.

Claim 14 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Binnig et al. in view of Azuma et al., further considered with Mamin et al. (US 5729026).

In regard to claim 14, Binning et al. and Azuma et al. were cited as teaching all the elements of claim 14 except for a heater comprising a doped region having an electrical resistance which is higher than the traces. Mamin et al. was cited as teaching that the heater comprises a doped region having an electrical resistance which is higher than the traces.

According to the Office Action, at the time of invention it would have been obvious to one of ordinary skill in the art to provide the apparatus of Binnig et al. with Azuma et al. and the doped heater of Mamin et al.

Since claim 14 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11, and for the following reason. While Mamin et al. shows a heater including a doped region, the Applicants respectfully submit that there is no teaching or suggestion in the cited references that a source or drain region of an FET can serve as a heater as specified in claim 11. It is only in hindsight in view of the Applicants' teachings that one skilled in the art would recognize that a source or drain region of an FET can serve as a heater.

All claims in the application are believed to be in allowable form. Allowance of the application is requested.

Respectfully submitted,

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